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ABSTRACT

A vocabulary list of 50 words based on children's spoken language was divided into six groups. For each group specific materials incorporating different modality presentations (pictures, tapes, transparencies, and word cards providing tactile emphasis) were developed. The modality preferences of 120 first graders were identified by The New York University Modality Test. A criterion test was developed and the pretest was administered. The children were then randomly assigned within each modality to one of four experimental groups (visual, auditory, kinesthetic, and combined) and a control group. All received the regular program of first-grade instruction, but the experimental groups received approximately 7 1/2 hours of small group instruction using one of the four presentation methods. The post-test was given after the instruction. Analyses of the data indicated (1) that the four experimental groups differed significantly from the control group but not significantly from each other, (2) that there were no significant differences among the groups when the subjects were categorized by modality preference, and (3) that there was no significant difference between the like treatment-modality preference group and the unlike treatment-modality preference group. Tables and references are included. (AW)

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Modality Preference, Differentiated Presentation of Reading Tasks, and Word Recognition of First-Grade Children*

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Investigation of the learning process, particularly the process of learning to read, has established that children learn to read through auditory, visual, and kinesthetic modes. Clinical evidence indicates that children with learning problems have greater facility in using one modality than another. Although reading clinicians have identified modality patterns of children with reading difficulties and have based their remediation upon their findings, there is still insufficient evidence to indicate whether teaching methods should emphasize the strongest or the weakest sensory modality of the learner.

Children without specific learning problems have also shown differences in the sensory modality preferred in the intake and processing of information. Children entering first grade appear to have developed strengths in one or more of the sensory learning modalities, but attempts to assess that modality preference and to adapt instruction to that preference have been almost non-existent.

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Leaders in the field of reading instruction, such as de Hirsch (4), propose that knowledge of a child's preferred mode of learning is basic to any instructional program. Dechant states:

> In addition to an understanding of the pupil's maturational, experiential, intellectual, neural, physical, social, emotional, motivational, language, and sensory characteristics, knowing the pupil means knowing his preferred mode of learning. Identification of the child's mode of learning may well be the end goal of classroom diagnosis....It would seem reasonable to utilize instructional materials which are congruent with each learner's particular strengths in perception, imagery, and recall. (3, p. 23)

Further, Morency (6) quotes Wepman as saying that it would be a continuing erroneous practice to approach all children as though they can learn equally well through the same modality.

In a recent study, Bursuk (2) investigated the relative effectiveness of combined aural-visual and predominantly visual teaching approaches in terms of the interaction with the various sensory modality learning preferences of adolescent retarded readers. She found a significant interaction between pupils' sensory modality learning preferences and the relative effectiveness of the sensory teaching approach used. Specifically, the combined aural-visual approach was more effective in improving the reading comprehension of auditory learners and pupils with no sensory modality learning preference than

it was in improving the reading comprehension of visual learners. Also, the predominantly visual approach was more effective in improving the reading comprehension of auditory learners and pupils with no sensory modality learning preference.

In a comparable study, Bateman (1) placed first grade children into groups based upon their modality preference and devised instruction to match the modality. She found that the auditory method of reading instruction was superior to the visual method for both reading and spelling; the auditory modality-preferred subjects were superior in both reading and spelling to the visual modality-preferred subjects, but there was no interaction between the subjects' preferred modality and the method of instruction used.

Robinson (7) attempted to determine the relative reading progress made by pupils with differing visual and auditory aptitudes when they were taught by a predominantly visual and a predominantly auditory approach to beginning reading. She found that both teaching approaches were equally effective with pupils having high visual-high auditory and low visual-low auditory perceptual abilities. Neither method was demonstrated to be consistently more effective than the other in compensating for inadequacies in specific modalities. Robinson warns of the tentativeness of these findings due to the small number of pupils who could be placed in the high visual-low auditory and the low visual-high auditory subgroups.

The research findings in the area of sensory modalities and reading ability have been contradictory and inconclusive. Inadequate

measuring instruments, lack of definitive instructional approaches, limited instructional time and materials, and variations in type of subjects studied are some of the factors that account for the conflicting reports.

This study, then, was designed to investigate the feasibility of identifying modality preferences of first-grade children and to determine the relationship between preferred learning modalities, differentiated presentation of reading tasks, and work recognition.

Procedures

Establishment of vocabulary for reading tasks

In order to establish a reading vocabulary which would be relevant to the children, samples of their oral language were analyzed. Approximately 30 pupils were randomly selected to participate in small group discussions. Each group of 3 - 4 pupils met with a member of the research team for informal discussions. The discussions were motivated and guided by pictures and specific questions involving urban life. The discussions were taped and typescripts were analyzed by a frequency distribution of nouns and verbs used by the children. This procedure insured a vocabulary list of 50 nouns and verbs based on the spoken language of the children and included only those words that had not yet been formally taught in the classroom.

Development of materials

As an initial step, the fifty vocabulary words were divided into six groups so that there was a unifying theme among the words in each group. The word groups were then placed in a teaching sequence. For

each group of words a set of black and white pictures was selected and a list of questions was developed to accompany the pictures. The pictures and related questions were needed to develop the concept of each of the fifty words.

In addition, specific materials incorporating different emphases were developed. For the auditory approach, tapes were prepared so that subjects could listen to the sound of the whole word in isolation, in context, and to the specific initial, medial, or final sounds in the word. For the visual approach, transparencies were prepared for use with the overhead projector. Each of these transparencies emphasized the configuration (size and shape) of the fifty words. Materials prepared for the kinesthetic approach included word cards on which the fifty words were outlined in pipe cleaners for a three-dimensional effect and tactile emphasis. Two types of reading materials, sentences and paragraphs, were also constructed using the fifty vocabulary words.

Construction of criterion test

Since vocabulary to be taught during the experimental treatment was taken from the pupils' oral language, the development of a criterion test was necessary. The previously established vocabulary list of fifty words plus an additional 150 words as distractors were used in the construction of the test.

This criterion test was used as a pretest and posttest measure of word recognition. Reliability was determined by the K-R formula applied to the posttest measure with the 106 subjects who completed the study. An r of .94 was obtained.

Sample

Subjects of the study were 128 first-grade children from an elementary school located in a low socio-economic area of New York City.

Initial testing

The New York University Modality Test (8) was administered to 128 children. The purpose of the test is to identify the preferred learning modality of a pupil from among auditory, visual, and kinesthetic modalities.

The visual subscale of the test consists of 27 items including symbolic shapes, individual letters, and two and three letter forms. The same 27 items in a three-dimensional form are used for the kinesthetic subscale. The auditory subscale used taping patterns and phoneme patterns. The auditory and kinesthetic subscales were administered individually while the visual subscale was administered in small groups. Three testing sessions were required for each child, and the total testing time was approximately one and one-half hours.

In addition to the New York University Modality Test, the criterion test, previously described was administered in each first-grade classroom. Testing time was approximately 20 minutes.

Assignment of pupils to groups

Upon completion of the New York University Modality Test, means and standard deviations were obtained for each subscale.

T scores were then computed for each subscale of the test. To determine each subject's preferred modality, intra-child T scores were examined. If any one of the three T scores exceeded the other two by

a minimum of ½ S.D. this modality was assigned to the subject as his preferred modality. Out of 128 subjects, 30 had an auditory preference; 33 visual preference; and 28 kinesthetic preference. The remaining subjects were classified as having no preference (37). The pupils were randomly assigned within each modality to one of four experimental groups and a control group.

Experimental treatment

The major difference in the experimental treatment was in the materials and procedures used in the direct teaching of the fifty vocabulary words. All experimental subjects were presented with black and white pictures, to stimulate oral discussion and thus to develop the concept of the words. Following the development of the concept the auditory presentation included listening to the whole word in isolation and context (both tapes and voice presentation were used), comparing and contrasting parts of words, matching word sounds, associating the phonemes with the printed form (graphemes), and selecting the printed form when it was spoken. In the visual presentation the subject associated the printed word with the picture, pointed out the visual characteristics of the word (transparencies and overhead projector), matched copies of the word to a model, and selected the word from among other words. The kinesthetic presentation included associating the three-dimensional form of the word (pipe cleaner outlined word form) with the concept, touching each letter, tracing the word, and writing the word using newsprint, crayons, or sandpaper. The subjects receiving a combination presentation associated the printed

word with the picture, pointed out the visual characteristics of the word, listened to the whole word in context, compared and contrasted parts of words, and traced the word.

After the differentiated presentation of the words, all experimental subjects were given a group of sentences and paragraphs for oral reading. Each pupil in the experimental groups received a total of approximately seven and one-half hours of small group instruction using one of the four methods of presentation. The control groups did not receive any special small group work. All subjects, both experimental and control, received the regular program of first-grade instruction including reading readiness activities and beginning reading using the Bank Street Readers.

Final testing

The criterion test previously described was administered to all subjects who completed the experimental treatment and to the control group.

Analysis and Findings

Since the small N in each cell precluded the use of a factorial design, several one way analyses of covariance or variance were used. Before applying an analysis of covariance to the data, a test of homogeneity of within groups regression coefficients was made. Since the F ratio for this was non-significant at the .01 level, the covariate analysis was undertaken.

The first analysis was a one-way analysis of covariance with unequal N's using teaching method as the independent variable, the word

recognition pretest as the covariable, and the word recognition post-test as the dependent variable. Table 1 presents the means and standard deviations of the pre- and post-word recognition test by treatment groups. Table 2 presents the covariance source table.

Table 1

Means and Standard Deviations of the Pre- and Post-Word Recognition Test by Treatment Groups

		Auditory	Visual	Kinesthetic	Combined	Control
Pretest	$\bar{X}$	18.30	19.33	21.05	18.32	19.32
	SD	9.19	11.41	10.22	10.21	10.28
Posttest	$\bar{X}$	35.26	34.62	37.48	29.50	24.63
	SD	12.17	11.87	14.09	13.54	13.54

Table 2

Source Table for the Analysis of Covariance by Treatment and Control Groups

Source of variation	d.f.	Adjusted Sums of squares	Mean Square	F
Between Groups	4	1957.5661	489.3915	5.2741*
Error	100	9279.1692	92.79	
Total	104	11,236.7353		

*significant P .01

Since the F ratio was significant, the Newman-Keuls multiple comparisons test was used to determine where differences between pairs of ordered adjusted means existed. Table 3 presents the results of the Newman-Keuls test.

Table 3

Newman-Keuls Test on All Ordered Pairs of Adjusted Means

Ordered adjusted means	24.56 control	30.32 combined	34.53 visual	36.09 auditory	36.59 kinesthetic

Differences Between Means

	Control	C	V	A	K
Control	--	5.76*	9.97*	11.53*	12.03*
C		----	4.21	5.77	6.27
V			----	1.56	2.06
A				----	.50
K					----

*Significant at .05. Since the original analysis had an a priori significance level set at .05, it was felt that the alpha level for the Newman-Keuls test should also be set at .05.

As can be seen from Table 3, there was a significant difference between each of the treatment groups when compared to the control group, but no significant differences among any of the treatment groups when compared with each other.

The second one-way analysis of variance was used to determine if

there was any significant differences on the posttest among modality preferences regardless of treatment groups. The pretest means, by modality group, ranged from 20.20 to 18.26 which meant that the largest difference between any two means was only 1.94. Since the F ratio for the analysis of variance of the pretest scores was <1, an analysis of variance was similarly used with the posttest scores. The means for the posttest were as follows: auditory group 32.56; visual group 32.90; kinesthetic group 31.27; weak preference 31.43, and no preference group 33.00. It can be seen that the largest difference between any two means was only 1.83 and thus it is not surprising that the F ratio for the analysis of variance was not significant.

Since the investigators were particularly interested in interaction and were not able to use a factorial design, a third one way analysis of variance was computed between like and unlike treatment-preferred modality groups. For this analysis only the forty-six subjects who were classfied as having an auditory, visual, or kinesthetic modality preference and who were in the auditory, visual, or kinesthetic treatment groups were used. Since an analysis of variance of the pretest scores yielded an F ratio of <1, a similar analysis was performed on the posttest scores. The source table for this analysis is presented in Table 4.

Thus, the results yielded no significant difference between those pupils who were taught by the method that corresponded to their modality preference and those subjects who were taught by a method that did not correspond to their modality preference.

Table 4

Source Table for Posttest Scores for Like and Unlike Treatment-Modality Preference Groups

Source of Variation	d.f.	Sums of squares	Mean square	F
Between Like-Unlike Groups	1	307.4095	307.4095	1.8674
Error	45	7407.8246	164.6183	(NS)
Total	46	7715.2341		

In summary, then, with reference to the analyses of covariance and variance of the word recognition posttest scores, the following results were obtained:

1. Each of the four treatment groups differed significantly from the control group but not significantly from each other.

2. There were no significant differences among the groups when the subjects were categorized by modality preference.

3. There was no significant difference between the like treatment-modality preference group and the unlike treatment-modality preference group.

Discussion

The findings revealed no significant differences among groups when they were considered as total treatment groups (differentiated types of word presentation) or as like treatment-modality preference and unlike treatment-modality preference groups on the word recognition criterion test. It is possible that the results were affected by one

or more of the following reasons.

First, the total number of subjects on which the analyses were made was only 106 when the total group data were analyzed and, thus, when specific cells were used the frequencies were relatively small. The effects, therefore, would have needed to be quite large to reach significance at the .05 level. An additional problem was the large within groups variation among pupils. Besides the student attrition rate, there was a high rate of absenteeism during the experimental treatment. Some children were absent as much as 50 percent of the time. In addition, the daily classroom reading instruction was not coordinated with the experimental treatments which used a modality approach and emphasis. The conventional basal reading approach for beginning reading instruction was used by the classroom teachers. The effects of the experimental treatment were apparently not strong enough to be distinct from the effects of a full-year's program of conventional basal reading instruction.

Recommendations

The investigators feel that the "theoretical rationales" that abound in relation to beginning reading instruction need to be explored further. Although the results of this study did not yield conclusive results, they were in accord with results reported by Bateman (1), Harris (5), and Robinson (7). It is felt that the study afforded many valuable insights that need to be pursued. It was found that children do have preferred modalities and that

these can be differentiated. A larger sample is needed, however, to yield larger cell frequencies for more precise analyses. The length of time used for the experimental treatment needs to be much longer. In fact, it is recommended that specific modality methods and approaches be used experimentally by classroom teachers for at least one full semester of regular first-grade reading instruction. Finally, the investigators feel that an intensive study of the beginning reading process is imperative so that children may be provided with reading instruction that uses their most efficient intake processes with the hope that maximum reading achievement will result. Only in this way can schools hope to reduce or eliminate the ever increasing problem of reading disabilities in the upper grades.

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